Amendments to the Specification

Please amend the paragraph before the title of the invention as follows:

~~DESCRIPTION~~

Please amend the sub-heading beginning on page 1, line 1, as follows:

BACKGROUND OF THE INVENTION
1. Technical Field

Please amend the sub-heading beginning on page 1, line 9, as follows:

~~Background Art~~
2. Description of Related Art

Please amend the paragraph beginning on page 1, line 10, as follows:

Generally, a butterfly valve has been known in which a plate-shaped valve element rotating around an axis roughly orthogonal to the flow-channel direction is rotatably composed with respect to the housing thereof. The butterfly valve is constructed so that it can control ~~its~~ flow rate by the valve opening degree of the valve element.

Please amend the paragraph beginning on page 2, line 13, as follows:

However, in the flow rate measuring method or flow rate controlling method of a butterfly valve mentioned in the above-described publication, since the dynamic torque which the valve element receives from a fluid is detected, only a part of the stress received from the fluid contributes to the torque, and in particular, the dynamic torque is radically decreased where the valve opening degree is in a nearly fully closed or fully open state. Further, since the dynamic torque to be detected is a torque oriented in the same direction as that of opening and closing movement of the valve element, it is difficult to detect only the dynamic torque received from the fluid. Therefore, sensitivity and accuracy are low, ~~wherein~~ and there is a problem in that, although the methods

can be used for fluids having almost the same specific gravity as that of water, measurement becomes difficult as the specific gravity ~~is~~ becomes smaller. Also, there is another problem in that, since it is necessary to detect the opening and closing torque and the dynamic torque of a butterfly valve with the torque separated from each other, the detecting means is complicated.

Please amend the paragraph beginning on page 3, line 9, as follows:

To the contrary, the orifice flow rate meter does not have the above-described problems since the flow rate is measured based on a differential pressure. However, there is still another problem in that there is a limit to the range of the flow rate due to the diameter of an orifice. Further, at a pressure measuring point at the downstream side, turbulence of a fluid, which is produced after the fluid has passed through an orifice, makes data unstable, and in particular, where the differential pressure is high, ~~unstability~~ instability of detection data is further increased. In the worst case, measurement itself may become impossible. In addition, since it is necessary for an orifice flow rate meter to be provided with two pressure-detecting portions at the upstream side and downstream side, there is a problem in that the structure for measuring ~~a~~ the flow rate cannot be constructed to be compact.

Please amend the sub-heading beginning on page 4, line 1, as follows:

~~Disclosure of the Invention~~

SUMMARY OF THE INVENTION

Please amend the paragraph beginning on page 4, line 2, as follows:

It is therefore an object of the invention to provide a valve structure, which is capable of detecting a flow rate therein and is able to carry out flow rate measurement

of higher sensitivity and accuracy than in the prior ~~arts~~ art, a flow rate measuring device using the valve structure, or a flow control device using the valve structure.

Please amend the paragraph beginning on page 7, line 8, as follows:

In the present invention, it is preferable that the above-described valve element is constructed so as to be rotatable around an axis that intersects the above-described flow-channel direction. Where the valve element is constructed. to be rotatable around the axis intersecting the flow-channel direction of fluid (in a case of a rotary valve) , although the valve opening degree of the valve element changes in compliance with rotations, the above-described stress detecting means is composed so as to detect a flow-channel-direction force component which is not directly influenced by rotations of the valve element, whereby influences due to the opening and closing operations of the valve element are reduced to increase the detection accuracy, and the detecting means can be simply constructed.

Please amend the paragraph beginning on page 12, line 14, as follows:

Next, a flow rate measuring method according to the invention ~~is characterized by comprising~~ includes the steps of: detecting a valve opening degree with respect to a flow regulating valve that is provided with a valve element operably disposed in a flow channel and is capable of regulating the flow of fluid according to the valve opening degree of the corresponding valve element; detecting the above-described flow-channel-direction force component applied to the above valve element by the fluid; and obtaining the above-described flow rate on the basis of the above-described valve opening degree and the above-described force component.

Please amend the sub-heading beginning on page 13, line 10, as follows:

~~Brief Description of the Drawings~~

BRIEF DESCRIPTION OF THE DRAWINGS

Please amend the sub-heading beginning on page 14, line 5, as follows:

~~Best Mode for Carrying Out the Invention~~

DETAILED DESCRIPTION OF THE INVENTION

Please amend the paragraph beginning on page 21, line 3, as follows:

Now, Fig. 3 shows the relationship between a strain ε and differential pressures ΔP when the valve opening degree θ is caused to fluctuate in a range from 6 through 60 degrees with water ~~flown~~ flowing in a flow channel. The graph shown in Fig. 3 indicates the relationship between the strain ε ($\varepsilon = \delta/E$, wherein δ is a stress and E is Young' s Modulus) and the differential pressure ΔP in a case where a strain gauge is used. However, since the strain is proportional to the stress, the relationship between the stress f and the differential pressure ΔP qualitatively becomes identical to the example shown in the drawing. Therefore, a positive correlation can be recognized between the stress f and differential pressure ΔP, and the relationship becomes almost ~~proportionality~~ proportional. In addition, generally, as described above, it is considered that there is a relationship where the differential pressure $\Delta P = B (f, \theta)$. However, judging from the data, it is understood that the differential pressure ΔP hardly depends on the valve opening degree θ, and is ~~almost~~ determined ~~only~~ almost exclusively by the stress f. In other words, basically, almost all the stress f, that is, a flow-channel-direction force component of a load applied to the valve element by fluid,

is produced by the differential pressure ΔP before and after the valve element (between the upstream side and downstream side).

Please amend the paragraph beginning on page 22, line 2, as follows:

As the valve opening degree θ changes, the shape of an orifice composed of the valve element changes. Therefore, the differential pressure ΔP will change by the valve opening degree θ. However, the correlation pattern (its linearity) hardly changes and fluctuation of the value is actually remarkably slight. Accordingly, in the process of obtaining the above-described differential pressure ΔP, the differential pressure ΔP may be directly obtained by using only the stress f without using the valve opening degree θ as described above. Thus, since the stress f detected in the present embodiment is a value onto which the differential pressure ΔP is almost accurately reflected, it is possible to remarkably increase the sensitivity and accuracy of the flow rate in comparison with a case where ~~values~~ values, which are produced with various types of parameters are complicated and mixed as in the prior art dynamic torque type, are used. Further, in the butterfly valve illustrated in the drawing, since the correlation between the prior art dynamic torque and the differential pressure ΔP greatly changes ~~by~~ with the valve opening degree θ, the sensitivity and accuracy are radically lowered in an area close to a state where a valve is fully opened or fully closed. However, since, in the present embodiment, the relationship between the stress f and differential pressure ΔP does not greatly change ~~by~~ in accordance with a change in the valve opening degree θ as the dynamic torque, it becomes possible to maintain the sensitivity and accuracy ~~in~~ over the entire range of the valve opening degree.

Please amend the paragraph beginning on page 27, line 1, as follows:

Further, the control means 15 may control so as to raise an alarm or close the valve, upon judging that a fluid reversely flows when the stress f is smaller than a

prescribed default value (for example, a value when the flow rate is 0) or the stress f is detected to be a negative value.

Please amend the paragraph beginning on page 31, line 11, as follows:

Also, a seat ring 11k secures sealability in a fully closed state of the valve element 11b, and a seat ring presser 11m holds the seat ring 11k at the housing 11a. Further, a guide ring 11i is a cylindrical member intervening between the axial supporting portion 11d and the housing 11a and prevents the stress detector 13A (load cell) from being damaged due to application of an excessive load. A ~~given. a~~ packing (O ring) 11j prevents fluid from invading the portion where the stress detector 13A is disposed.

Please amend the paragraph beginning on page 34, line 2, as follows:

In addition, since the flow regulating valve is of such a type in which the valve element rotates around the axial line intersecting the flow-channel direction, in a case ~~that~~ where a dynamic torque is detected it is necessary that the flow regulating valve is constructed so as not to detect a rotating torque of the valve element, that is, it becomes necessary to detect only the dynamic torque applied by a. fluid. However, in the present embodiment, since the above-described stress does not have a direct relationship with a rotating torque of the valve element, ~~wherein~~ the present embodiment is advantageous in that only the stress applied by a fluid can be detected using a simple structure with no special function.